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PATENT

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

**Applicant** : **Nicholas F. Borrelli, Thomas P. Seward III,  
and Charlene M. Smith**  
**Serial No.** : **Not Yet Assigned**  
**Filed** : **Simultaneously Herewith**  
**For** : **SILICA WITH LOW COMPACTION UNDER HIGH  
ENERGY IRRADIATION**

**Commissioner of Patents and Trademarks**  
**Washington, D.C. 20231**

**MODIFIED 1449 FORM**

<u>Examiner Initial</u>		<u>Document Number</u>	<u>Issue Date</u>	<u>Name</u>
<u>WMC</u>	1.	3,933,454	1/1976	DeLuca
<u>WMC</u>	2.	4,789,389	12/1988	Schermerhorn et al.
<u>WMC</u>	3.	5,043,002	8/1991	Dobbins et al.
<u>WMC</u>	4.	5,086,352	2/1992	Yamagata et al.
<u>WMC</u>	5.	5,152,819	10/1992	Blackwell et al.
<u>WMC</u>	6.	5,154,744	10/1992	Blackwell et al.
<u>WMC</u>	7.	5,325,230	6/1994	Yamagata et al.
<u>WMC</u>	8.	5,364,433	11/1994	Nishimura et al.
<u>WMC</u>	9.	5,410,428	4/1995	Yamagata et al.
<u>WMC</u>	10.	5,523,266	6/1996	Nishimura et al.

Class

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EXAMINER

3/11/03  
DATE

<u>MPK</u>	11.	5,616,159	4/1997	Araujo et al.
<u>MPK</u>	12.	5,668,067	9/1997	Araujo et al.
<u>MPK</u>	13.	5,707,908	1/1998	Komine et al.
<u>MPK</u>	14.	5,735,921	4/1998	Araujo et al.
<u>MPK</u>	15.	5,896,222	4/1999	Rosplock et al.
<u>MPK</u>	16.	5,958,809	9/1999	Fujiwara et al.
<u>MPK</u>	17.	6,087,283	7/2000	Jinbo et al.
<u>MPK</u>	18.	6,205,818	8/2001	Seward, III

FOREIGN PATENT DOCUMENTS

<u>Examiner Initial</u>		<u>Document Number</u>	<u>Date</u>	<u>Country</u>
<u>MPK</u>	19.	WO 93/00307	1/1993	PCT
<u>MPK</u>	20.	WO 98/07053	2/1998	PCT
<u>MPK</u>	21.	525 984 A1	2/1993	EP
<u>MPK</u>	22.	406016449A	2/1993	JP

OTHER ART

Examiner  
Initial

<u>MPK</u>	23.	Allan et al., "193-nm excimer-laser-induced densification of fused silica". <u>Optics Letters</u> , 21:24, December 15, 1996, 1960-1962..
------------	-----	---

*Michael Colavanni*  
EXAMINER

3/11/03  
DATE

2/1993

- MPK 24. Borrelli et al., "Densification of fused silica under 193-nm excitation", J. Opt. Soc. Am. B, 14:1606-1615, July 1997.
- MPK 25. EerNisse, E., "Compaction of ion-implanted fused silica," J. Appl. Phys., 45:167-174 (1974).
- MPK 26. Imai, et al., "UV and VUV Optical Absorption Due to Intrinsic and Laser Induced Defects in Synthetic Silica Glasses," in The Physics and Technology of Amorphous SiO<sub>2</sub>, edited by Roderick A. B. Devine, Plenum Press, New York, 153-159, (1988) .
- MPK 27. Lillie et al., "Fine Annealing of Optical Glass" J. Am. Cer. Soc., 37:466-473, 1954.
- MPK 28. Moynihan, et al., "Dependence of the fictive temperature of glass on cooling rate," J. Am. Cer. Soc. 59:12-16 (1976).
- MPK 29. Nagasawa et al., "Improvement of Radiation Resistance of Pure Silica Core Fibers by Hydrogen Treatment," Japanese Journal of Applied Physics, 24:1224-1228 (1985).
- MPK 30. Norris et al., "Ionization dilatation effects in fused silica from 2 to 18-keV electron irradiation," J. Appl. Phys. 45, 3876-3882 (1974).
- MPK 31. Primak et al., "The Radiation Compaction of Vitreous silica", J. Appl. Phys. 39, 5651-5658 (1968).
- MPK 32. Primak, W., "Dependence of the compaction of vitreous silica on the ionization dose," J. Appl. Phys. 49, 2572 (1977).
- MPK 33. Primak, W., Section C, "Ionization Compaction, " in "The compacted States of Vitreous Silica," vol. 4 of Studies in Radiation Effects in Solids, edited by G.J. Dienes and L.T. Chadderton (Gordon and Breach, 1975), 91-102.

Michael Colaninri  
EXAMINER

3/11/03  
DATE

- mpc 34. Rothschild et al., "Effects of excimer laser irradiation on the transmission, index of refraction, and density of ultraviolet grade fused silica", Appl. Phys. Lett. 55:1276-1278 (1989).
- mpc 35. Ruller et al., "The effect of gamma-irradiation on the density of various types of silica", Journal of Non-Crystalline Solids, 136:163-172, 1991.
- mpc 36. Schenker et al., "Degradation of fused silica at 193-nm and 213-nm," SPIE, 2440:118-125, 1995.
- mpc 37. Schenker et al., "Ultraviolet damage properties of various fused silica materials," SPIE, 2428:458-468 (1995).
- mpc 38. Schenker et al., "Material Limitations to 193-nm Lithographic System Lifetimes," SPIE, 2726:698-707 (1996).
- mpc 39. Schermerhorn, P. "Excimer Laser Damage Testing of Optical Materials," SPIE, 1835:70-79, 1992.
- mpc 40. Schroeder, "Brillouin Scattering and Pockels Coefficients in Silicate Glasses", Journal of Non-Crystalline Solids, 40:549-566, 1980.
- mpc 41. Shelby, "Radiation effects in hydrogen-impregnated vitreous silica", J. Appl. Phys., 50:3702- 3706, 1979.
- mpc 42. Smith et al., "193-nm excimer laser induced processes of fused silica," presented at 2<sup>nd</sup> International Symposium on 193-nm Lithography, Colorado Springs, CO, July 30-August 2, 1996.

Michael Chaurani  
EXAMINER

3/11/03  
DATE